Topography and Contouring
Teaching Assistant Guide

Learning Objectives:

At the end of the exercise the students will be able to

- read a contour map
- contour data
- draw a topographic profiles

Getting Started

1. Get an access code for Smith 111
   - This is your individual code – DO NOT GIVE IT TO ANYONE ELSE
2. Turn on both projectors using the remote controls
   - Do not adjust the projector settings – if they don't work call Jim Donahoe (348-1885)
3. Login into the main computer as *geowall*
   - You should already have the password. DO NOT WRITE IT DOWN ANYWHERE IN THE LAB
4. Hand out the 3D glasses to the students
5. Start ArcScene (*Programs – ArcGIS – ArcScene*)

Mariana Demo

1. From the ArcScene main menu select *File – Open*. Navigate to the Desktop and double-click on the *GEO-101 Summer folder*. Double-click on the *Topo Maps* Folder, again on the *Mariana f*older, and then again on *Mariana.sxd*
2. Drag the ArcScene window so that it covers both screens.
3. To pan and tilt the image click on the "Navigate" icon.
4. Click, drag and release the image to start it spinning
5. The left and right mouse buttons allow you to zoom or pan.
6. Explore all the features discussed in the student guide for this exercise.

Augustine Demo

1. From the ArcScene main menu, select *File – Open*. Navigate to the Desktop and double-click on the *GEO-101 Summer folder*. Double-click on the *Topo Maps* Folder, again on the *Augustine* folder, and then again on *Augustine.sxd*.
2. Drag the ArcScene window so that it covers both screens.
3. To pan and tilt the image click on the "Navigate" icon.
4. Click, drag and release the image to start it spinning. While the image is spinning discuss where the volcano is (island in the Cook Inlet near Anchorage), what sort of volcano it is (composite dome), and how high it is (1260 m), eruptive style (pyroclastic), and when it last erupted (Jan 11, 2006).
5. Introduce contour lines – lines of equal elevation that represent topography and contour intervals (vertical distance between adjacent contour lines); explain some basics of contour lines (close = steep, far = gentle, closed circle = hill, etc.)
6. In this demonstration the volcano is plotted along with 100 m contours.
7. Stop the image spinning (click and drag in opposite direction) and rotate it so that the summit is pointing towards the viewer.
8. Point out that the contours are closer together near to the summit – this happens when the slope is the steepest.
9. The image is vertically exaggerated by about ten times – to animate the vertical exaggeration click on the "open animation controls" icon and then hit play.
10. Pan and tilt the image so that the students can see the image from many points of view.
11. Explain the principles of a contour line and vertical exaggeration.

Alabama Topography and Geology

1. From the ArcScene main menu select *File – Open*. Navigate to the Desktop and double-click on the *GEO-101 Summer folder*. Double-click on the *Topo Maps* Folder, again on the *Alabama* folder, and then again on *Alabama.sxd*.
2. Drag the ArcScene window so that it covers both screens.
3. To pan and tilt the image click on the "Navigate" icon.
4. Point out the main features of the map – where is Tuscaloosa, Birmingham, Mobile.

5. Point out that the map is highly vertically exaggerated (75X!) – for example it looks like there are mountains on the coast. Anyone who has been there knows that it is as flat as a pancake!
6. This map has a geology layer. To activate it from the main menu click on Window – Table of Contents. Click on the check box next to the geol_tiff.tif layer.
7. It is now possible to see where the Appalachian Mountains dive below the coastal plain sediments (and hence better locate Tuscaloosa.)
8. Spend a moment exploring this image.

Mount Mazama - Topographic Profiles/Cross Sections

1. For this exercise you will need to turn off one of the projectors.
2. Define a topographic profile as a slice through topography between two points that shows the elevation varying with distance.
3. Instruct the students to Start ModelPress Reader 4.4 by double-clicking on the desktop icon. Do the same on your own computer. The students will follow along on their own computers during the following exercise.
4. From the main menu select File – Open. Navigate to the Desktop and then *GEO-101-Summer – Topo Maps – ModelPress*. Double-click on the file *crater_lake_water.wrl*.
5. Explain that we are looking at a three-dimensional representation of topography. The large depression is Crater Lake in Oregon. It was formed by the catastrophic eruption of Mount Mazama almost 7000 years ago.
6. Rotate the image by clicking and dragging with the left-hand mouse button.
7. From the main menus select *Tools - Cut/Cross-section*. Select the *Width Cutting Plane Orientation* and use the slider to adjust where the image is cut.
8. When you have selected your preferred cross-section click on the *Cross Section* check-box, and then on *Finalize.* Pan and tilt to show the profile to the students.
9. Repeat the process, clicking on *Clear Cut/Cross Section* before choosing another slice.
10. Give the students some time to explore this.

Mount Mazama – Contours

For this part of the lab, the students will be making sketches of maps and drawing topographic profiles. Give them several minutes for each step – circulate through the room to get an idea of how fast they are going

1. **Make sure that both projectors are turned on**
2. From the desktop open the *GEO-101-Summer* Folder. Within this open the *Topo Maps* and then *Immersaview* folders.
3. Double click on *topo.bat* to run the viewer. Once the image has loaded drag the edges of the window so that it fills both screens**.** Use the following keys:
   - "." (next image)
   - "," (previous image)
   - Left mouse button (LMB) to tilt
   - Right mouse button (RMB) to move the image up or down
   - Middle mouse button (MMB) to zoom.
4. The first image is of Crate Lake (crater_lake_water.wrl).
   a. Direct students' attention to the cones/hills (zoom in as necessary). Here they are asked to:
      i. Sketch the contour lines for the hill. Label the contours assuming a contour interval of 10 m and a total hill height of 605 m.
      ii. Note where the contours closest together
      iii. Determine why the contours are closest together at that location.
      iv. Draw a topographic profile through the center of the hill.
   b. Direct the students' attention to the caldera (remind them what a caldera is). Zoom/pan as necessary. The students are asked to:
      i. Sketch the contour lines for the large caldera (a depression created by a massive volcanic eruption) on the screen. Label the contours assuming that the contour interval is 10 m and that the elevation of the water in the lake is 100 m.
      ii. Draw a topographic profile through the center of the caldera

5. Move to the second image (click on "."). This is a 3-D image of a ridge/valley/ridge system.
    a. Orient the image so that the valley is in the middle. Here the students are asked to sketch the topographic map and show the likely location of a major stream.
6. Move to the third image. This is a 3-D image of a cliff.
    a. Here the students are asked to sketch the contour map.

Independent Exercises

The students will work in pairs on their own computers and complete the remainder of the handout.

    b. The students will be describing several landscapes and drawing short profiles.
    c. They will be able to run QuickTime movies to show the landscape in 3-D.

These exercises include a contouring exercise so you will need to go over the basics of contouring data (use handout from lab manual to explain rules)

1. Given the Tuscaloosa Quadrangle, ask the students to find the elevation of the locations on their handouts.

Closing the Lab

1. Collect assignments
2. Using the remotes, power down the projectors.
3. Close any running applications and/or folder.
4. Log off computer
5. Shutdown computer.
6. Put out cat
7. Turn of lights.
8. Close doors.